

Linzer biol. Beitr.	44/2	1715-1725	28.12.2012
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Studies on Phoretic Scelioninae (Hymenoptera: Platygasteridae) from India along with description of a new species of *Mantibaria* KIRBY

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Abstract: The present paper deals with descriptions of two species of Platygasteridae (Hymenoptera: Insecta) that are phoretic on praying mantids and grasshoppers from South India. *Mantibaria kerouaci* which is described here as new to science, forms the first species to be described under the genus *Mantibaria* from the Oriental Region, while *S. viatrix*, the type species of *Sceliocerdo* MUESEBECK, the monotypic genus endemic to India has been redescribed with ample illustrations.

Key words: *Mantibaria kerouaci* nov.sp., *Sceliocerdo*, phoresy, India, Platygasteridae.

Introduction

Among Platygastroidea, in subfamilies Scelioninae and Telenominae, the phenomenon of phoresy – the transport of adult parasitoids on the bodies of their host adults – is a common occurrence (RAJMOHANA & BIJOY 2011; CLAUSEN 1976; MASNER 1976; MUESEBECK 1972; BRUES 1917). Such phoretic forms have been reported mostly on orthopteran and heteropteran hosts and to a lesser extent on lepidopterans. The known phoretic instances under subfamily Scelioninae include, *Mantibaria mantis* on praying mantids (DODD) (MASNER 1976), *Sceliocerdo viatrix* (BRUES 1917) (*Lepidoscelio*, in lit.) on *Neorthacris* grasshoppers (RAMACHANDRA RAO 1952, BASAVANNA 1953a), *Synoditella* MUESEBECK on *Melanoplus* grasshoppers (LANHAMS & EVANS 1958), *Scelio opacus* on three species of grasshoppers (REES 1973) and also *Sceliomorpha bisulca* on short-winged locust (ASHMEAD 1893). *Sceliomorpha* and *Synoditella* are not represented in India (JOHNSON 2012).

During our studies on Platygastroidea of India, we came across a few phoretic Scelioninae. *Sceliocerdo viatrix* (BRUES) was found attached to the abdominal plates of a grasshopper, *Neorthacris acuticeps* (BOLIVAR) exactly the way as described by BRUES (1917) and BASAVANNA (1953b). After a gap of nearly 60 years this species is being reported again from India. *S. viatrix* is redescribed in this paper along with essential illustrations. We also describe here as new to science, *Mantibaria kerouaci* nov.sp., VEENAKUMARI & RAJMOHANA, a species from a genus known to be phoretic on praying mantids. *M. kerouaci* is the first species to be described in the genus *Mantibaria* from India, and also the Oriental Region.

Material and Methods

All the abbreviations and morphological terms used are based on MASNER (1979, 1980) and MIKÓ et al. (2007; 2010). Digital images were procured using AutoMontage version 3.6 using Leica DFC 425 camera, Leica M205A stereomicroscope and 1X objective lens.

The holotype and one paratype of *M. kerouaci* nov.sp. are deposited at the National Bureau of Agriculturally Important Insects, Bangalore, India and one paratype at IARI, New Delhi.

Seven specimens of *Scelioцерdo viatrix* are deposited at the National Bureau of Agriculturally Important Insects, Bangalore, India and one each at IARI, New Delhi and the National Zoological Collection, Zoological Survey of India, Calicut.

All specimens were collected through sweep net collections.

Abbreviations

frontal cephalic index.....	FCI	ocellar Diameter.....	OD
lateral cephalic index.....	LCI	post ocellar length.....	POL
head width.....	HW	lateral ocellar line.....	LOL
interorbital space.....	IOS	scutellum length.....	SL
length of transscutal line.....	TSL	scutellum width.....	SW
maximum length of mesoscutum.....	ML	metasomal tergites 1 to 7.....	T1-T7
width of forewing.....	WW	antennal segments.....	A1-A12
length.....	L	length of radicle.....	r
width.....	W	hind wing width.....	HWW
ocular ocellar length.....	OOL	hind wing cilia.....	HWS

Mantibaria kerouaci nov.sp. VEENAKUMARI & RAJMOHANA (Figs 1-7)

H o l o t y p e : Female: Length – 2.37 mm.

F e m a l e : Head and mesosoma brown both dorsally and ventrally; orbital border, occipital carina, mesoscutum laterally, mesoscutellum, metascutellum and propodeum on all sides with a narrow black border; ocellar region with a black tinge; metasoma golden brown, concolorous with legs and antenna; extremities of legs black; wings extremely clear.

Body moderately robust; FCI= 1.65, LCI=1.02; head 1.2 times wider than mesoscutum (HW/TSL=1.2), in dorsal view transverse and globular in lateral view and with a uniform leathery sculpture throughout, along with a few scattered erect setae; frons, occiput and vertex fully sculptured, scaly reticulate; with a shallow depression on median frons just above interantennal process; central keel substituted by a sulcus, extending upto median ocellus; entire head covered with few sparse pale setae; all three ocelli placed close together on top of vertex. POL 1.75 times as long as OOL (POL/OOL=1.75); OOL almost as long as LOL (OOL/LOL =1.23); OOL < 2x OD (5:3); occipital carina complete; eyes with very fine setae visible in 40X; temples large and well developed in dorsal view; as long as eye length; interocellar area darker than surrounding areas; clypeus trapezoid; maxillae and labium very distinct and yellow; mandibles tridentate with all three teeth equal, with faint striae radiating from its base onto malar region; setae on frons sparse, but denser and erect just above clypeus; A1 3 to 4 times as long as radicle (A1/r=4.4 in female, 3.2 in male); female antennal flagellum ten segmented and eleven

segmented in male; female antennae not clearly differentiated into clava; antennae honey brown (female) to yellowish brown (male) and clothed with setae; last flagellar segment elongated apically on one side, with 3 tubercles.

Mesosoma: 1.3x as long as wide; pronotum visible from above, shoulder angular; cervix dorsally smooth; epomial carina absent; cervical pronotal area with few faint striations and sparse setae; dorsal pronotal area and lateral pronotal area scaly reticulate; prothoracic spiracle very prominent; pronotal suprahumeral sulcus and mesonotal suprahumeral sulcus not foveolate; propleuron striated; promesopleural suture very broad and band like; skaphion and notauli absent; parapsidal furrows faintly and partly represented; mesoscutum highly convex, as long as wide (TSL/ML=1.12) and scaly reticulate; medially on its lower two-third with a longitudinal median carina or a faint median mesoscutal line, indicated at least in traces; preaxilla well developed and sclerotized; scutoscuteellar sulcus wide, not crenulate medially; mesoscutellum truncate (slightly drawn out medially at lower margin), protruding, scaly reticulate; longitudinal median keel distinct, but gradually merging with surrounding sculpture on its lower one-fourth; metascutellar plate rectangular, wide medially and laterally, not protruding over propodeum; metanotal trough finely striate obliquely; setae absent on mesoscutum and mesoscutellum; mesoscutellum twice as wide as long (SW/SL=1.92); metascutellar carina distinct; propodeum very broad, unarmed with seven to eight longitudinal carinae radiating upwards from its lower margin; upper lateral portion of propodeum differentiated into longitudinally striated, broadly depressed triangular area, prespiracular propodeal area demarcated by a high, raised carina; propodeum with a median longitudinal and two lateral carinae on either side, surrounded by a few irregular carinae; propodeum with no lateral or medial pilosity.

Metasoma broader at anterior end and tapering posteriorly; T1 medially depressed/concave, at its anterior end; all tergites with uniform scaly reticulate sculpture throughout; first five abdominal segments subequal in length (0.17mm in female and 0.19 mm in male); length of T6 0.5x length of T5; T7 smallest; in females T7 has two circular sensory plates; all abdominal tergites adorned with pale setae laterally; mesosternum and metasternum darker than other ventral parts.

Legs well developed with enlarged femur and tibiae; fore-tibia with a papilla-like blunt spine on its outer margin, opposite to spur; hind femur broad, laterally tapering along edges; all legs clothed with setae; first tarsal segment almost as long as 2nd and 3rd tarsal segments together; fifth tarsal segment enlarged and elongated, curved and as long as all four tarsal segments combined; claws and arolium well developed; arolium with chitinated edges; tarsal segments of hind leg larger than that of other pairs of legs; (0.051, 0.025, 0.018, 0.027, 0.131, 0.097 mm (arolium); claw 0.03 mm).

Both sexes alate; forewing wider than width of mesoscutum (0.64mm), hyaline, with no veins (WW/TSL=1.2); hind wing almost 10 times wider than marginal cilia (HWW/HWS=9.66); entire wing covered with small brown setae.

Male: Length 2.62 mm. Body both dorsally and ventrally fully black, except lower half of frons, gena, mouth parts and antennae, being honey brown in colour; mandibles brownish with three teeth, extremities black; all legs uniformly yellowish brown with black extremities; all other characters resembling that of female.

Etymology: As species of *Mantibaria* are phoretic we name this species '*Mantibaria kerouaci*' in honour of Jack Kerouac who wrote the immortal hitch hiking classic 'On the Road'.

Material examined: Holotype: Female, (Reg.No.ICAR/NBAII/P19), India : Karnataka: Bangalore (Hessaraghatta, Nandini Sperm Bank), 28.V.2010, sweep net, at a latitude of $13^{\circ} 10' 49.18''$ N, longitude of $77^{\circ} 30' 15.42''$ E, altitude 789.5 MSL habitat: grassland
Paratypes: One male (Reg.No.ICAR/NBAII/P20) and two females (Reg.No.ICAR/NBAII/P21) and (Reg.No.ZSI/WGRS/IR.INV.2264) with same data as holotype.

Biology: As per literature, *Mantibaria* are parasitoids of mantid eggs. Shortly after emergence, the adult female *Mantibaria* attaches herself to the abdomen of praying mantids, and often remain inactive, until oviposition by the host. Once the host mantid oviposits, the parasitoid descends into it at once and lays her eggs in those of the host, before the frothy covering of the egg mass has hardened (GALLOWAY & AUSTIN 1984). They are quite unusual in that they feed on the haemolymph of their host during their phase of phoresy (MASNER 1976).

Discussion: *Mantibaria* is represented in the Australian, Palearctic and Afrotropical realms; it is yet to be reported from the new world. PRABU & MANICKAVASAGAM (2004) reported *Mantibaria* from Tamil Nadu (India), without providing the species identity. Hence *M. kerouaci* nov.sp., described here becomes the first species under *Mantibaria* to be described from India as well as the Oriental Region.

Only three species, *M. mantis* (DODD) from the Australian region, *M. seefelderiana* (DE STEFANI) from the Palearctic region and *M. solygiae* RISBEC from the Afrotropical region (JOHNSON 1992, 2011) constitute the known world *Mantibaria* fauna. *M. solygiae* was reared from the ootheca of the mantid, *Soligia sulcatifrons* SERVILE 1893 while *M. mantis* was reared from the ootheca of *Mantis religiosa* (LINNAEUS 1758). MINEO and SZABO 1978, provide a fairly good description of *M. seefelderiana*. Descriptions of the other two species are however, sparse.

For the current study, available literature on all the three known species and the digital images of the type specimens available at The Platygastroidea website were referred to. The images of female holotype of *M. mantis* at http://osuc.biosci.ohio-state.edu/hymDB/eol_scelionidae.content_page?page_level=3&page_id=taxon_page_data&page_version=4901&page_option1=I and those of the syntypes of *M. seefelderiana* at http://osuc.biosci.ohio-state.edu/hymDB/eol_scelionidae.content_page?page_level=3&page_id=taxon_page_data&page_version=4902&page_option1=I were compared.

As per DODD (1913), head and mesosoma of both sexes of *M. mantis*, are black, while metasoma is dorsally black, and ventrally brown. But in *M. kerouaci*, the sexes are dichromatic, the females are with brown head + mesosoma and metasoma golden brown, while the males are totally black. In *M. mantis* OOL > 2x OD, while in the new species it is distinctly < 2x.

According to MINEO & SZABO (1978), in *M. seefelderiana*, both the males and females are black while in *M. kerouaci* nov.sp. only the males are black. T1 is more transverse, 5x as long as wide in *M. seefelderiana*, while it is hardly 3x in the new species. In the former, mesosoma is somewhat elongate, >1.7x as long as wide, where as in *M. kerouaci* it is only 1.3x.

As per RISBEC 1950, *M. solygiae* is known only by males and are reddish yellow in colour (in *M. kerouaci* nov.sp., all males are black). Their mandibles are reduced, with median denticles strong and the dorsal teeth are not as long as the median, while the ventral one is reduced almost to a stub (in *M. kerouaci* nov.sp. mandibles are tridentate with all teeth equal). T1 is nearly smooth in *M. solygiae*, whereas, it is scaly reticulate in

the new species. However, on examining the slide mounted types of *M. solygiae*, MASNER (1976) commented that the species may be conspecific with *M. anomala* KIRBY (= *M. seefeldiana*).

None of the three described species has a median ridge on mesoscutum; *M. kerouaci* nov.sp. can be diagnosed by a combination of the following characters: Sexes dichromatic, females with head and mesosoma brown, and metasoma golden brown, while males are totally black; body with a scaly reticulate sculpture throughout; $OOL < 2x OD$, POL also $< 2x LOL$; females with a prominent or atleast traces of a longitudinal ridge on median two-third of mesoscutum; mesosoma 1.3x as long as wide; median ridge on mesoscutellum prominent in both sexes.

Redescription of *Scelicerdo viatrix* (BRUES 1917) (Figs 8-15)

F e m a l e : Length - 3.45 mm

Head and mesosoma fully black; metasoma dark brownish black; all legs, radicle, scape, pedicel and first two flagellar segments yellowish brown, 3rd and 4th flagellar segments brown; antennal clava blackish brown; mandibles honey brown with extremities dark brown; eyes and lateral ocelli black and median ocellus white; wings hyaline. FCI: (HW/HH=1.02); LCI: (HH/HL=1.92); HW/IOS=1.72; Habitus strongly sculptured throughout.

H e a d : Head elongate and as broad as high, covered with sparse, short, white setae; snout protruding; entire frons longitudinally strigose, area between striae with transverse rugose reticulation, with striae reaching vertex; lower frons just above interantennal process slightly convex, genae very long, central keel absent; area lateral to interantennal process depressed and smooth, striae absent; lower middle margin of interantennal process fused with clypeus, interantennal process placed near to clypeus, with dense white setae towards its base; eyes very large and bare ($L=0.412\text{mm}$; $W=0.314\text{mm}$); lateral ocelli lower to inner orbits; POL 14 times as long as OOL ($POL/OOL=14.20$); LOL 8.5 times as long as OOL ($LOL/OOL=8.54$); a small raised carina present above lateral ocelli making ocelli situated on a slope.; lower genal region smooth while upper gena reticulate; medial vertex (region behind vertex) behind lateral ocelli sloping and deeply depressed in centre; medial vertex reticulate; space between these striae with some irregular rugae; clypeus broad and prominent concealing mandibles from frontal and lateral view; mandible large, sub tridentate with uppermost tooth longest, other two small and subequal; stipes very prominent, broad, black and sclerotized; occipital carina strongly developed with a well developed sharp tooth on each side of lower gena; occipital carina foveolate; gena with coarse reticulation but smooth towards spine at lower margin; post orbital carina distinct, encircling lower margin of eyes, inner margin reticulate, malar area smooth and shiny devoid of any sculpture, malar sulcus distinct, wider towards orbital margin.

Antennae 12 segmented; radicle slightly elongate and curved (i.e. loop like); scape elongate, with a sharp sclerotized carina on ventral surface and scaly reticulate; pedicel roundish with petiolated base; first four flagellar segments narrow, clava broad, 6 segmented and entire antenna thickly clothed with setae; proportions of length and width of antennal segments 39:10; 9:6; 6:4; 3:5; 3:5; 3:8; 7:9; 6:9; 5:9; 4:9; 4:8; 5:4.

M e s o s o m a : Pronotum clearly visible from above; pronotal shoulder long; latero-

dorsal pronotum coarsely reticulate; epomial carina present; pronotal supra humeral sulcus foveolate and slightly curved medially; cervical pronotal area smooth with sparse white setae; lateral pronotal area with parallel striae and interconnecting rugae; skaphion absent; mesoscutum strigose, with similar sculpture as of frons and vertex, but with larger reticulations; longitudinal elements much prominent, and extending to 0.8 of anterior mesoscutum; mesoscutal striae interconnected by irregular rugae; mesoscutum little longer than wide (TSL/ML=1.17); notauli absent; mesoscutellum triangular with coarsely reticulate sculpture; mesoscutellum nearly 2 times as wide as long (SW/SL=1.85); scutoscuteellar sulcus wide, non crenulate medially, narrow laterally; metascutellum produced into a transverse lamella which protrudes laterally simulating two spines; metanotal trough well developed and with an oblique row of foveae; netrion not distinct; posterior pronotal sulcus smooth and band like; femoral depression with faint transverse carinae; post alar process well developed; post scutellar sulcus and metascutellar plate reticulate, emarginate medially at lower margin; propodeum broad, clothed laterally with dense, fine white setae and with coarse but smaller reticulations than on mesoscutum and mesoscutellum; lower propodeal corners smooth and blunt; not produced into teeth; anterior row of fovea medially large; lower margin of propodeum emarginate; medial propodeal furrow short; nucha longitudinally striate.

Metasoma: Metasoma flattened with 6 visible tergites; T1 slightly convex; T2 with anterior depression; all tergites and sternites longitudinally strigose; space between these longitudinal striae with irregular reticulate sculpture; relative length to width proportions of tergites from T1-T5 being 4.5:13.6; 6.8:19.1; 12.4:22.7; 12.1:21.2; 8.9:14.9; T3 more than 1.8x as wide as long, (T3W/T3L =1.84); lateral ridges on T2 prominent; dense white setae on lateral sides of T1 and sparser on remaining tergites.

Wings: Both wings transparent, with submarginal vein dark brown in lower half and becoming transparent in latter half; stigmal vein short and yellowish; forewing wider than mesoscutum (TSL/WW= 0.92); hind wing with submarginal vein incomplete, stub like.

Male: Unknown

Host: Eggs of *Neorthacris acuticeps*

Material examined: Female (Reg.No.ICAR/NBAII/P22), INDIA: Karnataka: Mandya (Maddur), 26.XI.2009, sweep net, at a latitude of 12° 34' 47" N and longitude of 72° 27' E; (Reg.No.ICAR/NBAII/P23), 5.XI.2009; (Reg.No.ICAR/NBAII/P24,25,26,27) and (Reg.No.ZSI/WGRS/IR.INV. 2263) on 16.IX.2010, with same data as P22; all specimens collected by Veenakumari K. in paddy ecosystem.

Discussion

Sceliocerdo MUESEBECK (1912) is a monotypic genus, endemic to India and so far reported only from the South Indian states of Karnataka and Tamil Nadu (JOHNSON 1992; 2012). The genus was first described as *Lepidoscelio* by BRUES in 1917 with a single species *viatrix*, based on the specimens sent from Walajanagar (Tamil Nadu), South India. In spite of the host being preserved in alcohol, four females were found attached to the abdomen of the Deccan grasshopper (*Colemania sphenarioides* BOLIVAR) with their mandibles. It is surmised that when the grasshopper lays its eggs, the phoretic parasitoid descends from the host and parasitizes the host eggs (BRUES 1917). He also suggested

that since these adult scelionines attach themselves to the hosts by their mandibles, there is every possibility that they may be feeding on the haemolymph of the host insect.

During our field surveys for the collection of Platygastriidae, we came across this interesting phoretic association, where six females of *S. viatrix* were found attached with their mandibles to the abdomen of a wingless grasshopper, *Neorthacris acuticeps*, in a paddy field at Mandya, Maddur, South India, on 16.XI.2010. These wasps had securely attached themselves by inserting their mandibles at the intersection of two abdominal segments, by pushing up the segment in front, exactly as mentioned by BRUES (1917). Points of earlier attachment by the parasitoids were clearly visible as reddish lesions on the grasshopper abdomen. These wasps died remaining attached to the dead grasshopper. A few of them were also caught in the sweep net collections, from the same site, as mentioned earlier.

Acknowledgements

We thank Dr. N. K. Krishna Kumar, Director, NBAII and Dr. Radhakrishnan, Officer-in-Charge, ZSI, Western Ghat Regional Centre, Calicut, Kerala for providing facilities for conducting this work. We are also grateful to Sharanappa and B. N. Ashwini for assisting us in our field work and for processing samples. We also thank 'The Platygastroidea Planetary Biodiversity Inventory project (under National Science Foundation grant No. DEB-0614764)' for literature support.

Zusammenfassung

Vorliegende Arbeit beschreibt zwei Arten von Platygastriidae in Südindien, die phoretisch an Gottesanbeterinnen und Heuschrecken leben. Neu für die Wissenschaft ist *Mantibaria kerouaci* nov.sp., *Sceliocerdo viatrix* wird redeskribiert und grafisch illustriert.

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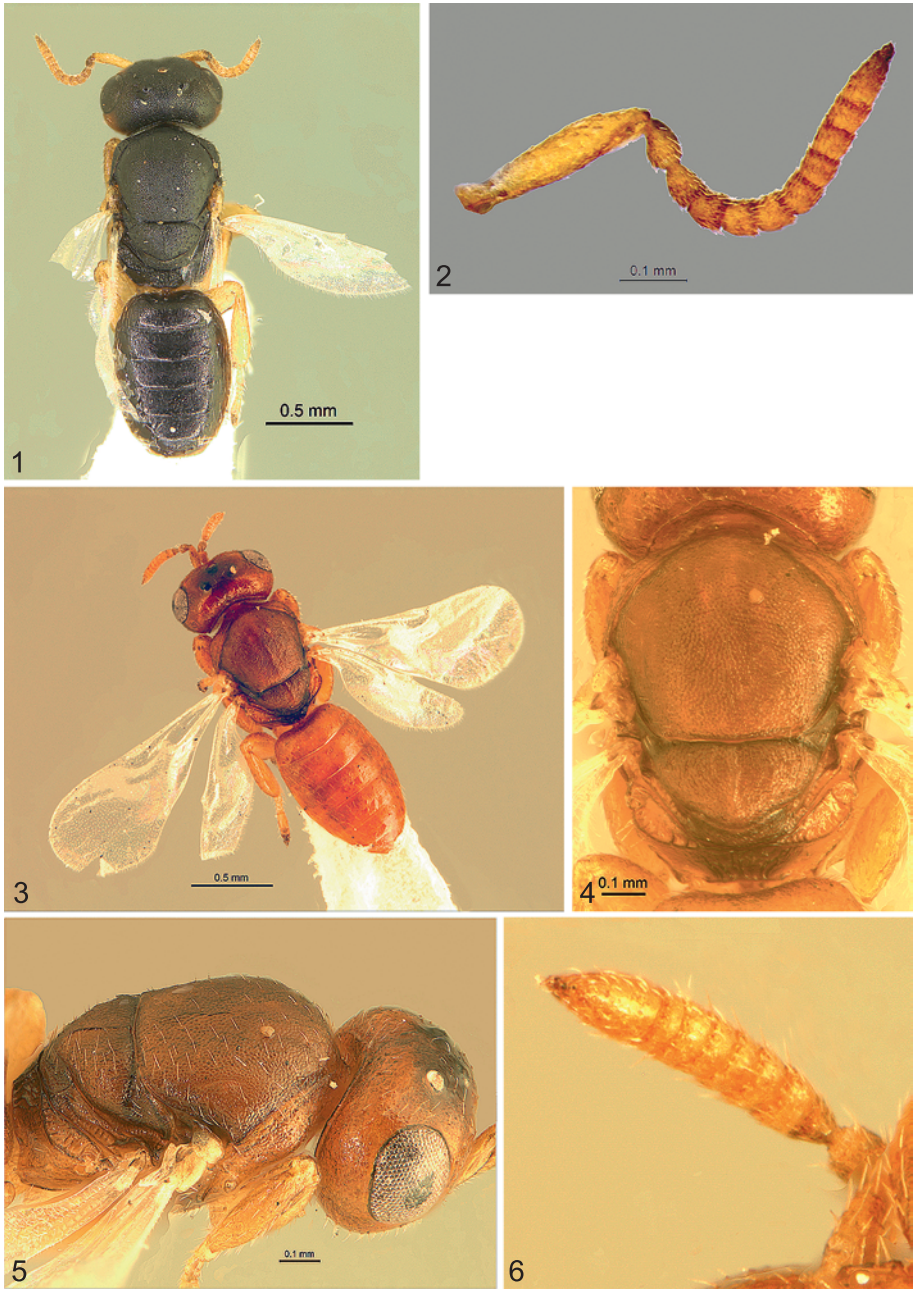
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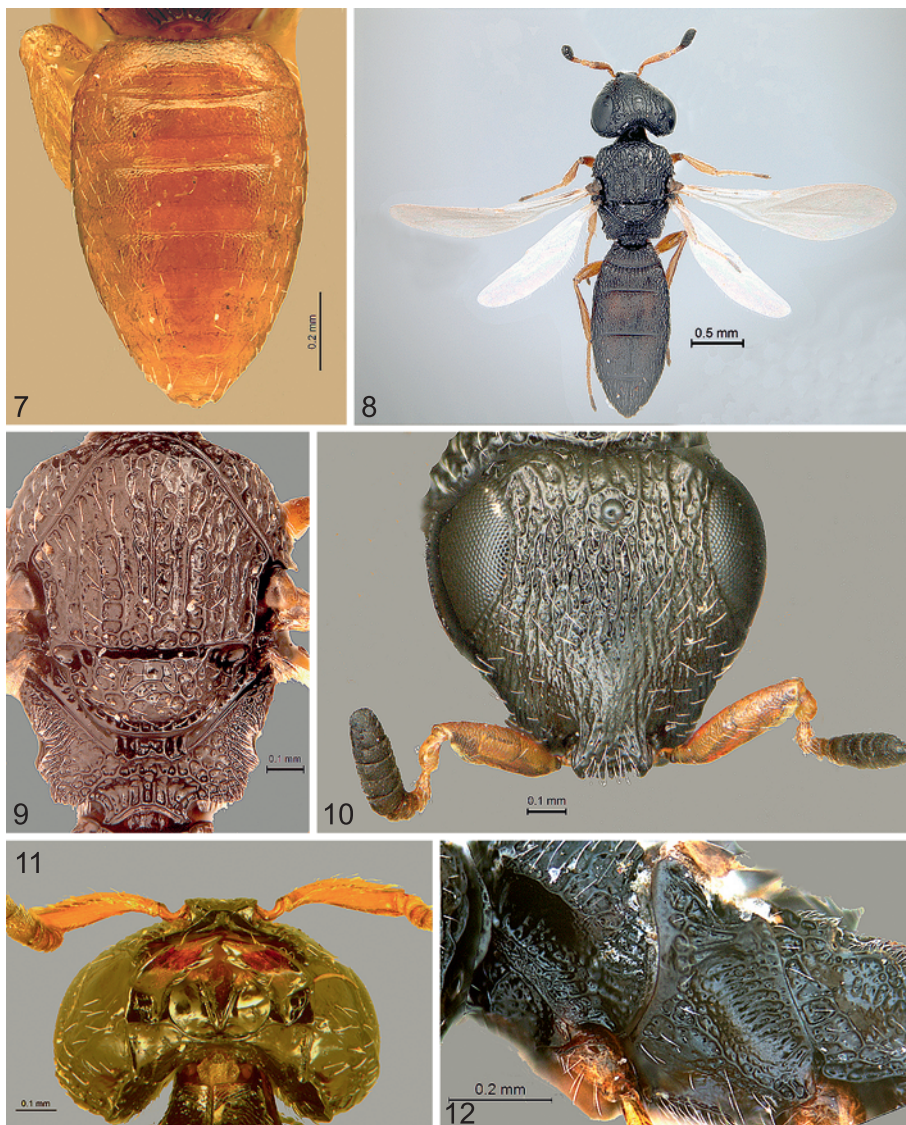
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Figs 1-6: *Mantibaria kerouaci* nov.sp.: (1) habitus male (dorsal view); (2) male antenna; (3) habitus female; (4) mesosoma dorsal view; (5) mesosoma profile; (6) female antenna.



Figs 7-12: *Mantibaria kerouaci* nov.sp. (contd.): (7) metasoma. *Sceliocerdo viatrix*: (8) habitus dorsal view; (9) mesosoma; (10) head front view; (11) head ventral view; (12) pleura.

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Figs 13-15: *Scelicerdo viatrix* (contd.) : (13) head lateral view; (14-15) phoretic females on grasshopper abdomen.